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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/765,880	01/18/2001	Gregory P. Crawford	12136.125	9292

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EXAMINER

AKKAPEDDI, PRASAD R

ART UNIT PAPER NUMBER

2871

DATE MAILED: 02/04/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/765,880

Applicant(s)

CRAWFORD ET AL.

Examiner

Prasad R Akkapeddi

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 November 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-47 is/are pending in the application.
- 4a) Of the above claim(s) 15-31 and 33-47 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-14 and 32 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 January 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-4, 7-13 and 32 rejected under 35 U.S.C. 102(b) as being anticipated by Sutherland et al. (Sutherland I) (U.S. Patent No. 5,942,157).

As to claims 1 and 32: Sutherland I, discloses a device having electrically controllable, variable reflection gratings (diffraction efficiency, note: diffraction is a form of reflection by a grating) (col. 1, lines 15-25) having a composition comprising a periodic array of liquid crystal disposed in a polymer matrix (PDLC) (col. 5, lines 18-25), the liquid crystal having an index of refraction that is variable in response to an applied electric field, wherein the index of refraction of the liquid crystal array (n_{LC}) and the index of refraction of the polymer matrix (n_p) are mismatched at first and second applied electric field strength (col. 17, lines 27-61). Sutherland I, discloses the application of external electric field across the ITO electrodes for applying the electric fields (col. 10, lines 15-16) and a means for the application of the electric field (figs. 14-17).

As to the previously added limitation in claims 1 and 32: Sutherland I does teach the electric field variation ranges from 0 to E_{max} (col. 17, lines 29-30) and that the refractive index of the liquid crystal n_{LC} and the refractive index of the polymer are different (mismatched) at electric fields ranging from zero up to a maximum value of E_{max} . They become equal only at a value of E_{max} (col. 17, lines 27-33). Hence, the mismatch of the indices of refraction of the liquid crystal and the polymer matrix is explicitly taught from Sutherland I teachings. Besides the continuous application of the electric field, from 0 to 325 volts, can also be seen in Fig. 2. Hence the teachings directly read on the previously added limitations.

As to the newly added limitations in claims 1 and 32: Examiner maintains the position that the teachings of Southerland I, when taken as a whole will still meet the recited limitation. For example: (a) Southerland I teaches that refractive index of the liquid crystal, n_{LC} , is a function of the applied electric field, having a maximum value when the field is zero and a value equal to that of the polymer, n_p , at some value of the electric field and thus, by application of an electric field, the refractive index of the liquid crystal n_{LC} , and hence the refractive index of the PDLC plane can be altered (col. 17, lines 27-33). Hence this expressly teaches a mismatching of the indices of refraction of the liquid crystal, n_{LC} , and the polymer, n_p , at a continuous selection of the electric field strength.

In addition, Southerland I (col. 10, lines 38-42) teaches a variation of the diffraction efficiency and the refractive index of the materials. When this teaching is combined with the teachings as shown in Fig. 4, i.e., the continuous variation of the diffraction efficiency with the applied voltage (electric field), it is clear that the index mismatching also continuously varies with the electric field.

(b) Southerland I teaches the degree of orientation of the liquid crystal with the applied electric field (col. 13, lines 18-35).

(c) Southerland I teaches the separation of liquid crystal domains during holographic formation (abstract and col. 1, lines 42-51).

Hence, when the above teachings are taken in total, Southerland I clearly meets the recited limitations in the instant claims.

[note: Orientation of the liquid crystal with the applied electric field and the phase separation during the creation of fringes of the hologram are also taught by Popovich (U.S. Patent No. 6,323,970) in col. 1, lines 10-25), which is provided for information purposes only].

As to claims 2-4: Sutherland I, discloses the application of various electric fields, including a field strength of zero volts (Fig. 4), as recited in instant claim 2, The alignment of the liquid crystal droplets with the electric field is disclosed in Fig. 8b and (col. 9, lines 47-53) and the various reflection wavelengths with the applied electric field is disclosed in Fig. 4.

As to claims 7-13: Sutherland I, discloses that the liquid crystal has a positive and negative dielectric anisotropy (col. 3, lines 41-42), as recited in instant the claims 7 and 8 and the dielectric anisotropy dependence upon applied field frequency is disclosed in (col. 13, lines 60-63), as recited in the instant claim 9. Sutherland I, discloses the application of these reflection gratings in switchable filters (col. 15, line 41), as recited in the instant claim 10. Sutherland I, discloses a power source for the application of the electric field (Figs. 14-17) and the electrodes being ITO that is electrically conductive (col. 7, lines 57-58), as recited in the instant claims 11-13.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

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invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 5-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sutherland I in view of Sutherland et al. (Sutherland II) (Applied Physics Letters 64 (9), 28 February 1994), the Applicant cited disclosure.

As to claims 5 and 6: Sutherland I, discloses an effective refractive index of the liquid crystal ($n_{\text{sub LC}}$) and a refractive index for the polymer ($n_{\text{sub p}}$) (col. 17, lines 27-30).

However, Sutherland I, does not explicitly state that the liquid crystal has an ordinary ($n_{\text{sub 0}}$) and an extraordinary ($n_{\text{sub e}}$) refractive indices and that the ($n_{\text{sub 0}}$ is not equal to $n_{\text{sub p}}$) and does not disclose that the indices are related by ($n_{\text{sub e}} > n_{\text{sub p}} > n_{\text{sub 0}}$).

Sutherland II, on the other hand in disclosing electrically switchable volume gratings in polymer-dispersed liquid crystals, discloses that the liquid crystal having an ordinary ($n_{\text{sub 0}} = 1.518$) and an extraordinary ($n_{\text{sub e}} = 1.738$) indices of refraction and the refractive index of the polymer ($n_{\text{sub p}} = 1.517$) (page 1076). Hence the relationships ($n_{\text{sub 0}}$ is not equal to $n_{\text{sub p}}$) and ($n_{\text{sub e}} > n_{\text{sub p}} > n_{\text{sub 0}}$) is satisfied, as recited in claims 5 and 6.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to adapt the specific indices of refraction for the liquid crystal and the polymer satisfying the indicated relationships to achieve devices with high diffraction efficiencies, as well as narrow band wavelength and angle selectivity (page 1074).

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6. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sutherland I, in view of Catchpole et al. (Catchpole) (U.S. Patent No. 5,644,330).

As to claim 14: Sutherland I discloses that the electrode comprises a conductive layer made out of ITO. Sutherland I, however, does not disclose that the electrode is a metallic electrode.

Catchpole, in disclosing a driving method for polymer stabilized liquid crystal displays, discloses that the electrode layer (18) may be a thin layer of metal such as silver, copper, titanium and molybdenum, including a thin layer of transparent conductive material such as Indium tin oxide (col. 3, lines 55-60).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to adapt the thin layer of metal in place of Indium tin oxide, as long as the metal layer is transparent (col. 3, line 54-55) for low energy consumption devices and for effective addressing of large, color displays.

Response to Arguments

7. Applicant's arguments with respect to claims 1 and 32 have been considered but are moot in view of the new ground(s) of rejection.

8. In addition, the Examiner would like to add the following responses:

(a) Applicant's argument No. 1 (page 14, lines 14-21): Sutherland I teaches a 100% and 0% diffraction efficiency and an all or nothing diffraction grating and there is no teaching or suggestion regarding how the index mismatching is effected.

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Examiner's response to argument 1: As pointed out previously, Sutherland I establishes a connection between the index mismatch and the diffraction efficiency (col. 10, lines 38-42) and in Fig. 4 teaches how such diffraction efficiency varies with the continuous application of the electric field. Hence, the assumption that Sutherland I teaches all or nothing diffraction grating is not correct.

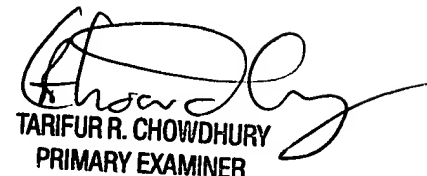
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Prasad R Akkapeddi whose telephone number is 571-272-2285. The examiner can normally be reached on 7:00AM to 5:30PM M-Th.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert H Kim can be reached on 571-272-2293. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

BRA

Prasad R Akkapeddi, Ph.D
Examiner
Art Unit 2871


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PRIMARY EXAMINER